



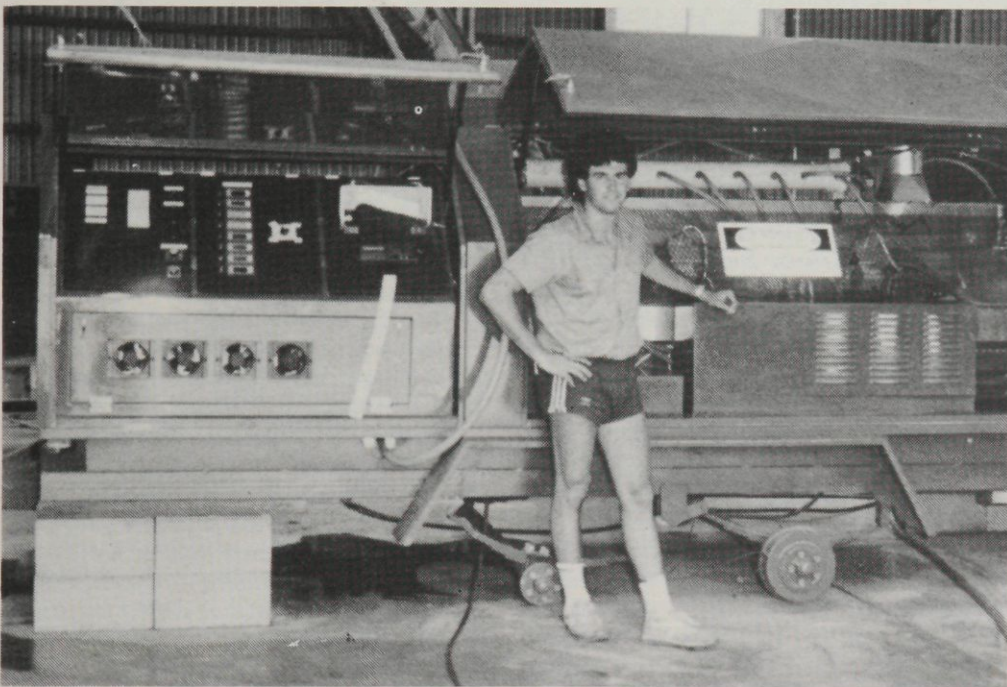
THE UNIVERSITY OF WOLLONGONG GAZETTE

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March-April 1987

Microwave drying—the next big leap for Australian industry and technology



The microwave drying test unit at Coniston. In the foreground is Mr Paul Mourtos of the Microwave Applications Research Centre's technical staff

IN 1985 Uniadvice at The University of Wollongong was approached by an outside firm for advice on the drying of peat moss. The inquiry was duly passed on to Dr Arnold McLean of the Department of Mechanical Engineering. And from that starting point there has emerged an entire new area of research. Already it sees a 300 Kw microwave unit in service, drying peat at Bombala in NSW. More important, it sees Australia

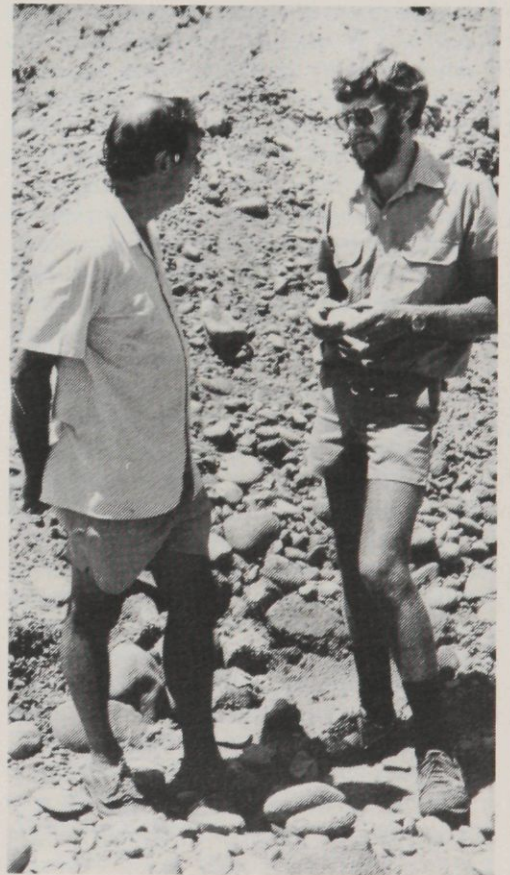
abreast with the world in the technology of the drying of solids—an extremely wide range of solids—by means of microwave energy.

A Microwave Application Research Centre, initially incorporating a 40 Kw microwave processing unit, has been set up jointly by The University of Wollongong, Industrial Microwave Applications Pty Ltd—formerly Hi-Tec Control Systems—and the Illawarra County Council. The Centre will have the capacity to undertake contractual research in microwave technology. This work will be arranged through Uniadvice, the consulting arm of The University of Wollongong.

The official opening ceremony of the Coniston Centre was carried out by Mr Peter Cox, the NSW Minister for Industry and Small Business, Energy and Technology, on Friday March 27.

Aware of the work under way in Europe and the US, Dr McLean suggested microwave energy as an efficient method for drying peat moss. Contact with the Australian microwave energy researcher, Mr Allan Fry, was then established. Subsequently, Allan Fry published his findings in *Engineers Australia* and

... and looking
back 45,000
years—see page 3



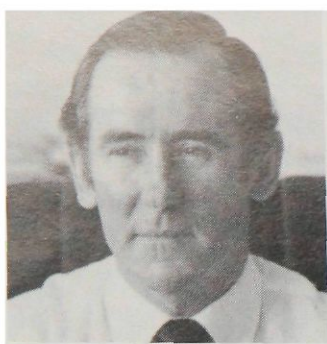
Fr Eugene Stockton and Dr Gerald Nansen at the Penrith quarry site, where artefacts dating back 45,000 years have been discovered

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had some of his conclusions come under attack from other engineers. Dr McLean carried the research further and became convinced that Fry's claims could be substantiated.

This confidence was also shared by the marketing personnel of the Illawarra County Council.

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Restructuring and exhilarating progress

by the Vice-Chancellor

IN 1986, the University of Wollongong began to display very visibly the profound changes which have been in train in recent years. Everywhere today there are pleasing signs of growth and development, not least in those academic activities which comprise the heart of the University. Most of the changes have come about as a consequence of realising a carefully worked out development plan, and the energies released among staff and students have given the University an exciting dynamism. Moreover, we have only just started.

Now into 1987, the University can no longer be considered small in size or provincial in outlook. It has entered the middle range of Australian universities in size and is reaching out nationally and internationally with innovative academic programs and with its work in technology development and transfer. During 1986 a number of new professorial appointments of high calibre were made to head new ventures and to recognise the expansion within existing departments and schools. The university has fortunately been recruiting on a buyers market and as a consequence has secured a substantial number of very able new staff; there was a 13 per cent increase in the number of academic appointments from 1985 to 1986.

Research and postgraduate study were reorganised as part of the responsibilities of a new appointment to the position of Deputy Vice-Chancellor (Academic and Research). Academic research activity continued to strengthen; academic staff are also reaching out in research fields nationally and internationally with more enterprising attitudes. Between 1984 and 1986, the total value of external research grants doubled; in the same period new enrolments in Ph.D. programs nearly trebled. While neither total is yet at the level we will be satisfied with in the long run, these aspects of university

development are clearly on the move. Similarly, the number of Research Centres increased to six during the past 12 months.

A new Centre for Transport Policy Analysis was launched and the Automation and Engineering Applications Centre had its first full year of operation. A professorial head was appointed to the Centre for Multicultural Studies and the Centre for Technology and Social Change continued to enhance its reputation as an adviser to governments (in Australia and overseas, particularly in Asia) and industry.

Changes to the physical environment on campus were marked in 1986. The Engineering/Science Building, housing the Departments of Electrical and Computer Engineering, Biology and Geology, was completed. By the start of this year, the new Administration Building was three months away from completion and construction of the Technology Centre and the next stages of the Michael Birt Library, the Union and the Indoor Sports Centre had begun. Extensive roadworks, including the campus ring road and improvements to carparks, were initiated during 1986 to unite and enhance significantly an already aesthetically pleasing campus. By December so much work was in progress that the campus resembled one large construction site, the aim being to complete the roadworks at least before the new academic year began.

Stage II of Koolobong, the University's on-campus student residences, opened in 1986. Off campus, the University, by virtue of an excellent long-term financing arrangement with the former owner, BHP, added a third residential college, Weerona (95 beds), to its Halls of Residence. With the assistance of loans managers of Australian banks the University is endeavouring to combine self-help and loans to overcome the shortage of government funding for student housing and other urgently needed

capital works.

The University's growth beyond a stage where its management could continue to be handled by the growing numbers of departments and schools demanded a rethink of the academic structure. A new structure was put into place in which Faculties became the major management units. The Faculties were regrouped into six: Arts, Commerce, Education, Engineering, Mathematical Sciences and Science. Their former passive role as merely co-ordinators of Departmental activity was changed to an active and influential one, including increased responsibility for authority to the allocation of funds among the Faculty units. Each Faculty is headed by a Dean. A Dean of Students has been also appointed to improve liaison with the student body and to provide direct oversight of the system of student advice and similar matters.

The changes in the University's academic structure also achieved structural integration of all of the University's previous academic units, departments, schools of the former advanced education component and the Research Centres. The residual gap between the activities of the University and the former Institute, remaining after the federation of 1982, was officially closed.

The most important feature of the achievements of 1986 was the evolution of a coherent academic structural base and sense of identity from which the University can more confidently plan the next major stage of its future. The University has scaled up to medium size very successfully and quickly and now needs to contemplate the requirements of its next stage of growth. A University-wide Planning Conference was held, just before this issue closed for press, at which the leaders of the academic and administrative units identified the objectives of this next stage and the strategies needed to reach them.

Undeniably, the unfavourable funding position of the University makes life difficult. We do not have enough recurrent or capital funds and consequently must not only make every dollar do the work of two, but also use every available strategem to harness external sources of funds to our needs. That said, it is nevertheless exhilarating to be part of a university which is acquiring an increasing reputation and meeting its objectives with conspicuous success.

Ken McKinnon

Appointment of Head, Halls of Residence

THE University has appointed Mrs Cynthia Halloran to the newly created position of Head, Halls of Residence.

Mrs Halloran was selected from a strong field of applicants to be responsible for the efficient and effective operation of the

University's residential accommodation—now housing 400 students in three different locations: International House (200 students) and Weerona (to open this year, 100 students) are collegiate style halls; Koolobong (100 students) provides self-contained group housing.

As chief executive officer of these residences, Mrs Halloran will focus on the pastoral care of the students, with a particular responsibility for International House, and management of the budget,

buildings and staff. She will be supported by a Deputy Head and small office staff.

Cynthia Halloran is admirably qualified to head the Halls of Residence. She holds a BA(Hons) degree from the University of Queensland and an MA in History from the Australian National University. She brings many years of experience working with and teaching young people at university level. Her most recent position was as Director of International Student Services at St Thomas University in Miami, Florida.

Sydney's Early Settlement, 45,000 Years Ago

Australia's oldest known archaeological site



Another picture of Fr Stockton and Dr Nansen, seen here inspecting artefacts at the site

AUSTRALIA is about to celebrate the bicentenary of the arrival of the first European settlers at Sydney Cove. Yet at a distance of only 60 km from this first white settlement, and in the western suburbs of modern Sydney, is situated the oldest known archaeological site in Australia. Drs Gerald Nanson and Bob Young of the Geography Department at Wollongong University, and Fr Eugene Stockton, who is a Catholic Priest and a part-time archaeologist, have recently described artefacts found within the 45,000-year-old gravels of the Cranebrook Terrace on the Nepean River near Penrith. This work, now in press with the journal,

Archaeology in Oceania, is bound to create a stir among Australian prehistorians, for the site is about 5,000 years older than the next-oldest archaeological site in Australia, that being on the upper Swan River in Western Australia. Equally important is that the Nepean site, in combination with evidence from the Swan River, confirms the widespread occurrence of prehistoric people on the Australian continent over 40,000 years before present (BP).

Gerald Nanson and Bob Young have been studying the geomorphology and sedimentology of the Cranebrook Terrace since 1982, but its great archaeological significance did not become apparent until last year. Artefacts were known to occur within the terrace, for Eugene Stockton described a number of tools found there in 1973.

Determining the age of the site, however, proved problematic. A radiocarbon date from wood found in association with the artefacts gave an age of only 27,000 years BP, a result not of great archaeological significance.

In a very detailed analysis of the geological evolution of the Cranebrook Terrace, Nanson and Young dated additional timber deposited within the gravels, getting ages not much older than 27,000 years. Still not convinced that these results were entirely accurate, they sent additional samples to the Australian National University with specific instructions to check for any slight contamination of this old wood. Younger organic carbon mobile within the ground water can impregnate ancient organic matter, resulting in erroneously young dates.

Sure enough, these very carefully dated samples revealed contamination by younger carbon but, more importantly, they showed

the true age of this buried timber to be greater than 40,000 years BP.

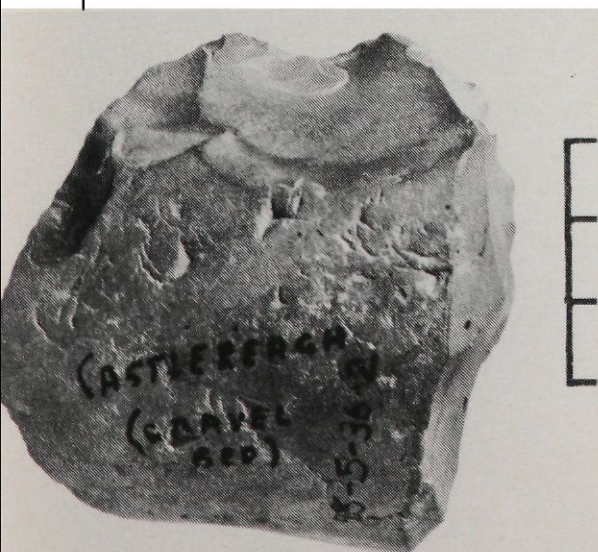
Further confirmation of this considerable age came from *thermoluminescence dating*, a technique quite independent of radiocarbon dating (see the *Gazette*, Nov. 1986). This approach showed the gravels in which the artefacts were found to be 43,000-47,000 years old.

Suddenly the Cranebrook Terrace took on a new significance. It had been formed before the last major glaciation about 27,000-13,000 years ago and prior to the existence of Mungo Man believed to have lived in western New South Wales about 35,000 years BP. Recognising the archaeological significance of their results, Gerald Nanson and Bob Young approached Eugene Stockton for collaborative work. The latter confirmed the existence of additional artefacts, and together they were able to describe the type of environment inhabited by these ancient people.

Unlike the present Nepean River which has a deep, narrow, single channel, the river of 45,000 years ago was very wide and relatively shallow. It was characterised by numerous islands and gravel bars. The early inhabitants undoubtedly used the river as a source of raw materials for making stone implements. They roughly fashioned these by striking one stone against another. No occupational sites have been identified, only discarded tools buried in the river gravels, so it is likely the river bars and islands were temporary tool-making and possibly hunting sites, frequently flooded by a river far more energetic and flood-prone than the present Nepean.

Analyses of pollen and buried wood show the

A steep-edged scraper made of brown chert found at the site by Eugene Stockton. The scale is in centimetres



continued on back page



Department of Mathematics researchers working on the Fourier transform theory are, from left, Dr Shahab Ghahreman, Dr Rod Nillson, Dr Noel Smyth, Professor John Warmus and Ms Annette Worthy

Transform Theory a unifying theme in mathematics research

A BASIC CONCEPT in mathematics is that of a *function*. Here, a function will be thought of as a signal which varies with time. At a given time, a signal will have a certain intensity which is measured by a number. Thus, a function may also be thought of as a number varying with time.

Mathematicians visualise functions by means of *graphs*. The time values are

visualised as points on a horizontal line, while the values of the intensity are visualised as points on a vertical line.

Figure 1 shows the graph of the function, denoted by f , which is equal to 1 for time values between -1 and 1 , and which is equal to zero for all other time values.

Figure 2 shows the graph of the function, denoted by g , which is equal to 1 minus the time value for time values between 0 and 1 , 1 plus the time value for time values between -1 and 0 , and 0 for all other time values.

The Fourier Transform is a mathematical operation which changes one function into another function. It is named after the French mathematician and physicist Joseph Fourier (1768-1830). Figure 3 shows the graph of the Fourier Transform of the function f of figure 1. Figure 4 shows the graph of the Fourier Transform of the function g of Figure 2. Notice the "wavy" character of the transforms.

The Mathematics Department at The University of Wollongong is conducting research which is concerned with both theoretical and applied aspects of the Fourier Transform.

In Fourier Transform theory, there are certain fundamental functions called *frequencies*. A single frequency may be thought of as an ocean wave which goes on forever, and whose crests always have the same height and the same distance apart—the height of the crests is the maximum intensity of the frequency, and the distance apart is the time between occurrences of maximum intensity. The Fourier Transform is useful because, when applied to a given function, it tells us the frequencies present in the function, and the extent to which these frequencies reinforce each other. There has been a great deal of mathematical research which endeavours to understand better the relationship between the function and the frequencies of which the function is composed—this area of research is known as *Fourier analysis*.

A physical example of the decomposition of a function into its frequencies is an effect noted by Sir Isaac Newton in the seventeenth century. If white light is passed through a prism, then it is seen to split into light of various colours—these colours correspond to the frequencies present in the original light signal.

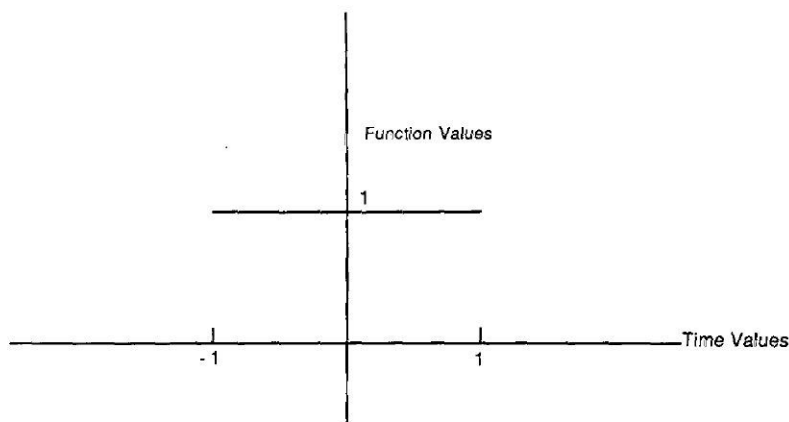


Figure One

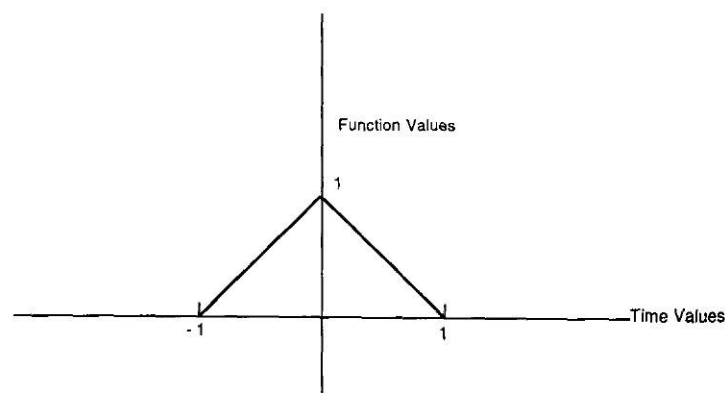


Figure Two

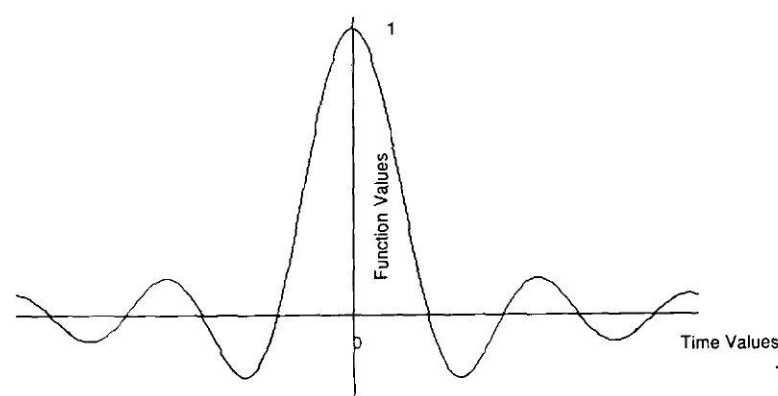


Figure Three

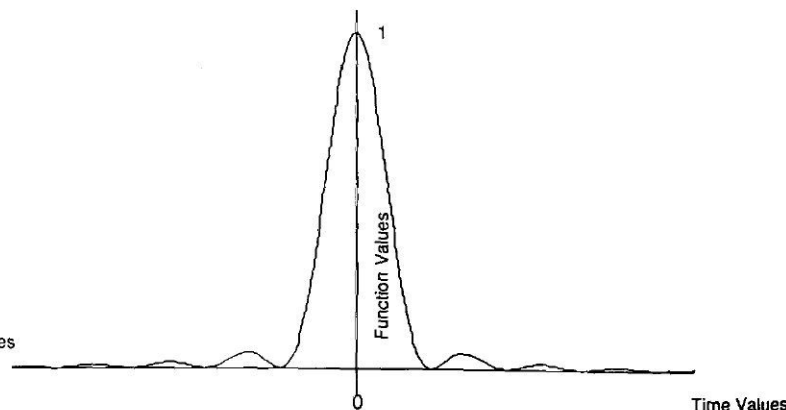


Figure Four

If a function has a complicated behaviour, it may be difficult to calculate the values of its Fourier Transform. For this reason it is common to use computers to find the values of the Fourier Transform of a function. These calculations can be very long. In 1964, a more efficient method for doing these calculations was discovered. This method is known as the *Fast Fourier Transform* and is the one commonly used today for numerical calculations involving the Fourier Transform.

Recently, Dr Rodney Nillsen has obtained results which describe, in certain cases, those functions whose Fourier Transforms consist of a series of straight-line segments—these functions are precisely those which can be expressed as a (possibly infinite) addition of functions such as appear in figures 3 and 4. This also enables descriptions to be given of those functions whose transforms consist of a series of horizontal line segments, as well as of those functions whose transforms consist of a series of straight line segments which are all joined to each other.

Some applied research is being done by Dr Noel Smyth, who is using the Fast Fourier Transform (FFT) to study wave propagation and flow problems. For example, consider the flow of air over an obstacle such as a mountain. Using the FFT, the flow at an initial time may be decomposed into its frequencies. The evolution of the flow of each frequency may then be studied, obtaining components of the evolution of the original flow. Again using the FFT, these components may be recombined, to obtain a description of the evolution of the flow of air over the mountain. This method is based on the idea that it is easier to analyse the evolution of each frequency separately than it is to try and analyse the evolution of the original flow as a whole. Figure 5 illustrates the evolution of such a flow—the obstacle to the flow is on the horizontal axis at 85.0, and each separate curve shows the wave at a different point of its evolution (the higher the curve, the later the point).

The FFT is also being used by Mr Shahab Ghahreman in work on the response of linear oscillators. A very simple form of linear oscillator is where a weight hangs from a

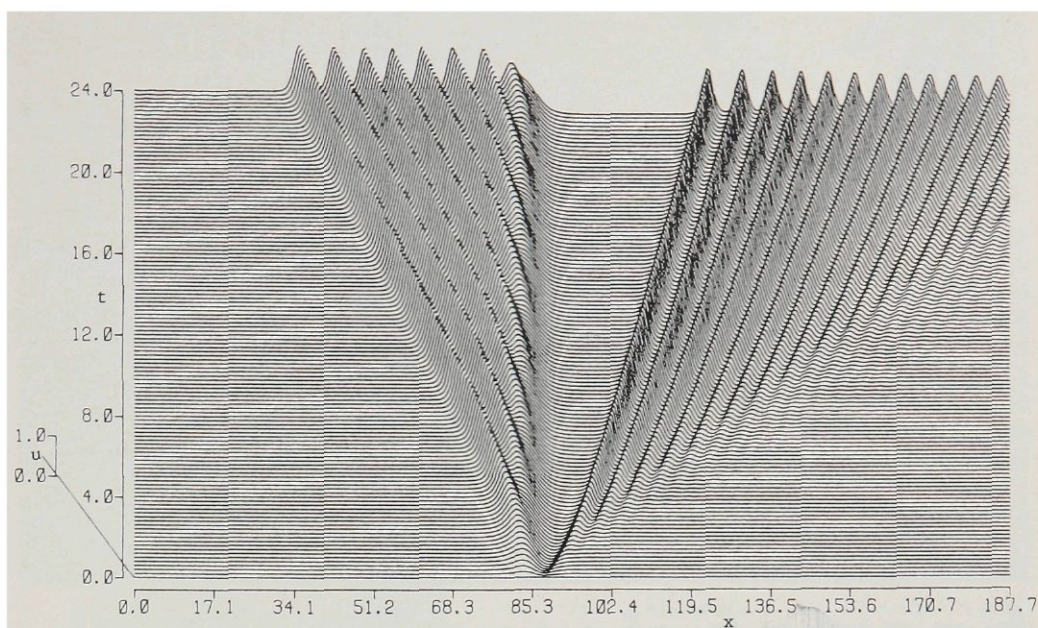


Figure Five

spring—if the weight is pulled, it will oscillate. He imitated the behaviour of the oscillator on a computer, a technique known as simulation. This was done about 3,000 times. Each time this was done, the values of the response function describing the oscillator were calculated at 2,000 points. To carry out these extensive calculations efficiently, Mr Ghahreman modified the algorithm for the FFT, and used a program written by Henri Nussbaum in the computer language APL. An important parameter in the design of many engineering systems is how large the maximum output of the system is likely to be when the input follows a certain type of random pattern. His work gives insight into how large this maximum output is likely to be for a given system.

The Fourier Transform is useful in oceanographic research. Ms Annette Worthy is studying the behaviour of edge waves off the eastern Australian coast. Edge waves are waves which are influenced by the off-shore topography or continental shelf. These waves move along the coast, and their motion perpendicular to the coast is oscillatory. The behaviour of the waves may be described in

mathematical terms by a function which satisfies a certain equation, and also satisfies conditions along the boundary, in particular where the land meets the sea. This equation may be solved using the Fourier Transform, and thus the function describing the waves may be explicitly calculated. Of particular interest are the magnitudes and periods of the waves—the period is the time it takes for a wave crest to move into the position occupied by the preceding crest. Her work is providing a better understanding of what conditions, such as the wave period, lead to beach erosion and sedimentation, and to the phenomenon of ‘resonance’ in Port Kembla harbour which, when it occurs, forces the shipping to move out and anchor at sea.

Several years ago, Professor John Warmus, formerly of the Polish Academy of Sciences and now associated with the Mathematics Department in Wollongong, proposed a new theory for transforms which are closely related to the Fourier Transform. He is continuing work in this area, endeavouring to develop a theory of functions of certain operators which are similar to the Fourier Transform.

'GONG'S THE GO FOR STUDENTS

In a supplement on university places in *The Telegraph* for January 30, Wollongong was the only university to be the subject of a feature article.

The Telegraph said, under the heading ‘Gong’s the go for Students’:

‘Increasing numbers of Sydney students are turning their backs on the more established universities and heading south.

‘One of the reasons according to spokesmen for the University of Wollongong are equal learning opportunities with less hassle and what they believe is a more friendly and relaxed environment.

‘And accessibility, once a daunting prospect when a twice daily trip was required, has been comfortably overcome by the electrification of the rail system from Sydney to Wollongong backed by air-conditioned trains.

‘Almost half the student population are Sydney residents.

‘Originally a college attached to the University of NSW, Wollongong became a university in its own right in 1975. And although numbers are considerably lower than its metropolitan counterparts it is the fastest growing university in Australia.

‘The residential capacity of the University has also increased and more than 400 students are now accommodated on campus.

‘Since 1982 student numbers have doubled from 4,000 to 8,000 and the figure is expected to reach 10,000 by the end of the century.

‘Faculties have expanded accordingly.

‘Students now have the option of a list range of subjects ranging from the creative arts to the engineering, nursing and sports sciences.

‘In the past the emphasis was on engineering in line with the industrial environment of the area; a spokesperson said.

‘But like Wollongong itself, that has changed significantly.’

‘She believed a large part of the University’s appeal was while it had all the facilities required of a university, it allowed for individual attention to specific student needs.

‘A modern university with an impressive number of facilities, it has all the facilities needed for both study and recreation yet according to spokesmen lacks the sometimes aggressive atmosphere of the more heavily populated universities.’



In the Centre for Human Movement and Sports Science laboratory, Jim Bayeman of the Illawarra Hawks, on the test apparatus, is watched closely by, from left, Mr Tom Penrose, Associate Professor Frank Pyke and Mr Harry Fuller

Sports Science Research

ONE of the research directions taken by the Centre for Human Movement and Sports Science is in the area of sports performance. The findings have relevance not only to high performance sport but also to the large number of individuals who regularly participate in social sport.

In addition to assisting the Illawarra Hawks basketball team with a systematic program of physiological fitness testing, staff from the Centre have been engaged in coaching behaviours. With the aid of videotapes taken during National Basketball League games, attempts have been made to correlate changes in team score with the coaching methods em-

ployed in actual contests. The assessed coaching behaviours have included the frequency of providing positive and/or negative reinforcement, the amount of technical instruction offered and the timing of decisions to call breaks in play and make substitutions. The video clips are also being edited into a short film that can be used as an aid for young coaches. This research has been co-ordinated by Dr John Gross and Mr Tom Penrose and Mr Harry Fuller have been specifically involved with the Illawarra Hawks. Research relating the incidence of injury to playing technique and conditions has been completed in netball and rugby by Dr Peter Milburn and Mrs Julie Steele. As one of highest participation sports in Australia, net-

High priorities in Community Health

COMMUNITY HEALTH and Health Promotion are high priorities within the health care system in the 1980s. A 'new public health' concept is increasingly employed to define the factors which influence a community's health status. The new public health recognises the importance of social, cultural and economic factors as well as personal and environmental factors as potential sources of ill-health or disease. Accompanying this recognition of a broadened definition of health is the recognition that maintaining a community's health is the responsibility not just of the individuals within the community or of the health care system but of all the groups and authorities within a community who constitute the social system.

The School of Health Sciences in The University of Wollongong intends to adopt this concept of public and community health as the central philosophy of its teaching and research efforts in Community Health. Graduate degree programs in Community Health are being planned and a major research and development initiative is under way in collaboration with the Illawarra Area Health Service.

This initiative follows a model developed by the World Health Organization and piloted in Europe. It is called the Healthy Cities Project and its goals are to improve the health of cities through the operation of certain principles incorporating community participation and co-operation among various government, private and community agencies to promote health. This project will provide

surfaces and to alter the rules to allow a greater time for stopping. As in the basketball studies, a video is being produced to educate coaches regarding the key factors to be considered in decreasing the potential of players for incurring lower limb injuries. The sports of rugby union and rugby league have also produced a number of unfortunate neck injuries, particularly during scrummaging. An analysis of the forces emanating from rugby union scrummaging shows that they can exceed the threshold for serious injury in the spine. It has been demonstrated by the research that adoption of a hip binding technique reduces the vertical forces acting on the front row and therefore reduces the likelihood of the scrum collapsing and injuring any of the participating players.

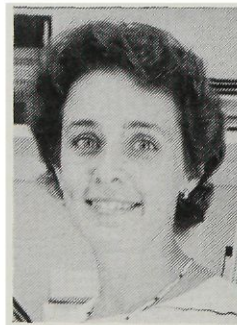
Other applied sports research projects being developed in the Centre include an analysis of the safety features of surfboard design (Dr Peter Milburn) and the design and construction of wheelchairs for disabled individuals (Dr Graham Ward). As a result of the close association between the Illawarra Academy of Sport and the Centre, particular attention is also being given to devising suitable physiological tests for young athletes.

Dr Frank Pyke, well known throughout Australia as a sports physiologist and educator and acclaimed as 'the man who fixed Dennis Lillee's back injury', has been appointed Associate Professor in Human Movement and Sports Science in the School of Health Sciences at The University of Wollongong.

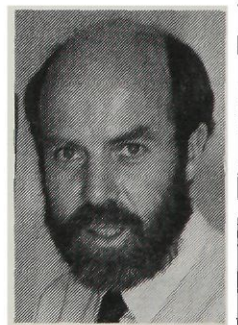
Dr Pyke was Head of the Centre for Sports Studies at Canberra College of Advanced Education.

He has an extensive sporting background which began by achieving state champion level in high school track and field events. He has played Australian Football, Perth; American Football, Dallas Cowboys; and cricket with the Perth Cricket Club.

played in actual contests. The assessed coaching behaviours have included the frequency of providing positive and/or negative reinforcement, the amount of technical instruction offered and the timing of decisions to call breaks in play and make substitutions. The video clips are also being edited into a short film that can be used as an aid for young coaches. This research has been co-ordinated by Dr John Gross and Mr Tom Penrose and Mr Harry Fuller have been specifically involved with the Illawarra Hawks. Research relating the incidence of injury to playing technique and conditions has been completed in netball and rugby by Dr Peter Milburn and Mrs Julie Steele. As one of highest participation sports in Australia, net-



Christine Ewan



Dennis Calvert

a context and a platform for teaching and research in community health.

Members of the School of Health Sciences who are responsible for developing these programs in Community Health are Professor Dennis Calvert, Head of the School, and Associate Professor Christine Ewan, who is the first conjoint appointee of the University and the Illawarra Area Health Service.

Christine Ewan has a background in general medical practice, education and social anthropology and has worked for the past ten years in the School of Medical Education at the University of New South Wales where she taught and conducted research in educational program design, adult education and professional socialisation.

Dennis Calvert has a long standing interest in coronary heart disease and nutrition, both areas of major public health concern. He is chairman of the National Heart Foundation Diet and Heart Disease Advisory Committee.

The University of Wollongong part of new national database and videotex communication system for Australian engineering industry

WHEN the National Engineering and Information Service (NEIS) national videotex and database service was officially launched by the NSW Premier, Mr Barry Unsworth, The University of Wollongong took another step in the area of university-industry collaboration. NEIS is financially backed by Westpac, and is jointly sponsored by the University, BHP and Unisys. Its purpose is to provide an efficient communication and information service for the Australian engineering industry.

General Manager of NEIS, Mr Mike Piatek, says that Australia is the first country to have such a service. NEIS, he says, brings together Australia's engineering resources and the manufacturers, sub-contractors, tenderers and exporters who need those resources.

When setting up the service, National Engineering Information Services Pty Ltd held consultations with the Metal Trades Industry Association.

Based at the Illawarra Technology Centre in Wollongong, NEIS provides a combination of videotex systems and on-line computer bureau services to the nation's engineering industry.

NEIS uses the Unisys 1100 mainframe computer at The University of Wollongong.

Software for the service was developed entirely in Australia.

NEIS will provide a total communication system for companies with engineering skills, services or products and for their customers.

Mr Piatek maintains that Australia's engineering industry has lost contracts not because of a lack of engineering skills but because of a lack of communication. He feels that Australia's competitive edge has been dulled because we don't know what other companies are doing, or are capable of doing.

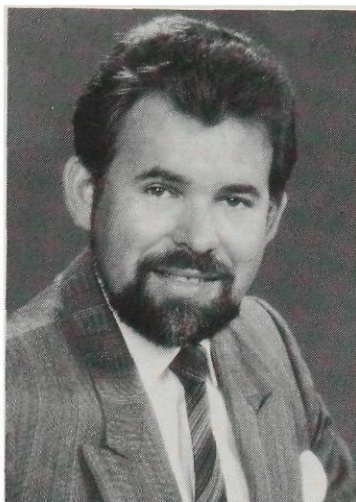
A combination of computer-based data banks and display screens with keyboards and a simple telephone connection can be used by organisations looking for specific engineering skills.

By using NEIS, they can quickly find the companies that offer those skills.

Large firms can contact the Unisys 1100 directly using the Unisys Mapper fourth generation language (4GL) to obtain the information they need.

This is believed to be the first time anywhere in the world that Mapper has been interfaced with a public access videotex system. NEIS believes it may even be the first time that any 4GL has been interfaced with a public access videotex system.

Smaller companies can access NEIS using most personal computers, with a modem and



NEIS General Manager, Mike Piatek

Prestel software, or using a simple videotex terminal.

Currently direct dialling is available and, from this month (March), Viatel connection will be possible, so that for the cost of a local

telephone call, users will be able to access the service from anywhere in Australia.

For \$450 a year, contractors can use menu-driven videotex terminals to access NEIS. Some 50 companies have already obtained terminals in order to use the service. NEIS also allows engineering industry advertisers to highlight new products, pricing and delivery information.

By specifying the exact engineering parameters, sub-contractors may use the service to find the firm that can supply their needs.

The NEIS database currently lists about 500 companies and their engineering capabilities, and the information is continually being updated and expanded.

Companies may use the service to put out jobs for tender and engineering firms may use NEIS to tender for those jobs.

NEIS also acts as an information processing service to the engineering industry itself. It offers software for processes such as steel estimating or even general accounting. Full support and training in the use of NEIS are provided. A job-progress reporting module enables contractors to monitor the progress of a project whenever they want to.

Future developments include a suppliers' on-line ordering and invoicing module, coupled to an indexing system that will enable users to search for different products. This will be available by June.

Also under development is a technical database of metallurgical equivalents. This will give details of Australian standards and their relation to foreign standards.

This technical database is expected to be available in the third quarter of 1987.

National Engineering Information Services is at 323 Keira Street, Wollongong, NSW 2500. Telephone (042) 27 2522.

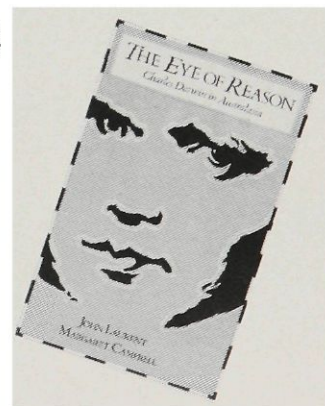
Wollongong has its own University Press

The Eye of Reason, a book about Charles Darwin's voyage to Australasia 150 years ago, is the first work to be published by the newly established University of Wollongong Press. The book was launched on **February 23**.

The University of Wollongong Press has been established to facilitate the publication of works by members of the University community. The editor, Professor Dudley Jackson, said, 'We hope this will be extended to include works by members of the Wollongong community generally.'

As we approach 1988, *The Eye of Reason* is an appropriate choice because it makes a unique contribution to Australia and world heritage. It documents a little-known event in Australia's history—Darwin's visit in the *Beagle* to the Bay of Islands in New Zealand, Sydney Harbour, Tasmania and the Cocos Island. While in Sydney, Darwin travelled across the Blue Mountains to Bathurst. Also on board the *Beagle* was the famous artist, Conrad Martens.

The authors, John Laurent and Margaret Campbell, have taken photographs, con-



temporary drawings and paintings from the 1830s, together with extracts from Darwin's original journal (some of which have never previously been printed) to provide a graphic picture of what Darwin saw in Australasia.

Dr Campbell is a lecturer in the Department of Science and Technology Studies at The University of Wollongong.

Dr Laurent was a research fellow in the Department of Science and Technology Studies. He was recently awarded the Colonel George Johnson Scholarship.

For further information contact the University Media Liaison Officer, Gillian Curtis, (042) 27 0926.



Among those primarily involved in the microwave drying research are, from left, Dr Frank Paoloni, Professor Howard Worner and Dr Arnold McLean

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The Microwave Application Research Centre was formed after extensive and thorough discussions between participants. Appointed by the University as its Honorary Professor and Interim Director is Howard K. Worner, CGE, FAA, FTS, a scholar with a lifetime of experience in Australian industry and as a university academic. He has been an industrial consultant since 1981. Before that he was a Member of the National Energy Research and Development Committee, and before that Chairman of the Victorian Coal Committee, later Council, and Chairman of the National Energy Advisory Committee. From 1964 to 1975 he was Director of New Process Development, CRA, Ltd. The list of his degrees and appointments extends over three typed sheets.

He is today 73. At the University of Melbourne he majored in Chemistry, Metallurgy

and Geology. He was Gold Medallist in the School of Mines in 1932 and graduated BSc with First Class Honours in 1934. His MSc was obtained with First Class Honours in 1936. He was awarded the Melbourne DSc for published work in 1942. He was then only 28. . . .

There are many reasons for drying materials. But chiefly their handling and in some cases subsequent process efficiency is improved by drying, and transportation costs are lowered because of reduced weight. In the case of a novel smelting process, during which there is the need for the moisture to be removed, the process is speeded (and hence costs cut) by the use of microwave energy.

Tests by the Bureau of Mines Twin Research Centre at Minneapolis, Minnesota, have shown remarkable advantages for drying by microwave as compared with other methods. Drying efficiencies of 95 per cent have been recorded on fine coal, whereas air drying methods are usually ineffective at high moisture levels; and there are problems with normal hot-air (thermal) drying. Likewise, here in Australia, as in the US, there is an increasing awareness of the need to dry coal in order to reduce transportation costs, to reduce heat loss in the burning process and therefore increase burning efficiency.

In an article in the US journal, *Coal Age*, microwave drying is stated to be more effective, and more selective, than other methods since heat is generated internally as well as near the surface of the material being treated. This is because microwave energy penetrates most non-metallic materials such as, for example, coal to an appreciable extent. Coal, however, is a poor absorber of penetrating microwave energy, while water is a good absorber.

When drying with microwave energy there is an inherent tendency for the wettest portions to absorb most energy and for the driest portions to absorb the least energy, or for a uniformly dry product to result. This property, which is sometimes called 'moisture levelling' is an important factor in the advantages

seen for microwave as against other drying methods.

The range of materials already treated by the Wollongong Research Centre on their test apparatus at Coniston includes molasses peanut hull mix—the ingredients are both waste products—which dried by microwaves converts to a high-protein cattle feed. It is interesting to note that previous attempts to dehydrate (or dry) molasses using membrane technology, and even after an investment of \$1.75m, proved unsuccessful.

In stark contrast, the Wollongong Research Centre was able to demonstrate to visitors from Queensland a successful result after an investment of only one-man month. The possibilities in this area alone are felt to be extremely promising for the Australian economy.

Another research area concerns the drying of pyrethrum as part of the million-dollar industry based on the cash crop which has been established in Tasmania on the initiative of Commonwealth Industrial Gases (CIG). The flowers are harvested to provide the extract which is refined to become the key element in insecticides. Chief existing sources of supply are the equatorial countries of Africa and some parts of South America, so that the import bill to CIG—Australia's major user—is considerable. When the Tasmanian farms are producing, and the pyrethrum harvested, Wollongong's researchers see microwave drying as a natural part of the production process.

The aims of the Centre are summarised in a pamphlet produced by Uniadvice:

- (1) To establish the principles applying to the microwave drying process and to explain the exceptional performance.
- (2) To review the mechanical engineering aspects of microwave technology and assist with design upgrading.
- (3) To review the electrical engineering aspects of microwave technology and assist with design upgrading.
- (4) To investigate the variables affecting dryer performance and develop guidelines for optimum tuning.
- (5) To research specific applications, and materials handling designs and develop guidelines to suit.
- (6) To investigate the implications of microwave technology for electricity utilisation.
- (7) To pursue research in all the aspects of microwave technology.
- (8) To encourage and foster higher learning in related disciplines in conjunction with the appropriate Departmental Chairpersons.

Achievement of these aims will require the multidisciplinary expertise of Dr Frank Paoloni and Professors Smith and Bradlow in the Department of Electrical and Computer Engineering, Professor Peter Arnold in the Department of Mechanical Engineering, Associate Professor Nick Standish in the Department of Metallurgy and Materials Engineering, and Professor Peter Cooke in the Department of Geology.

For more information on the work of the Centre, contact Mr Peter Sophios, Manager, Uniadvice, The University of Wollongong, P.O. Box 1144, Wollongong 2500. Telephone number is (042) 27 0390.

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area to have been vegetated with grasses and eucalypt, casuarina and callestemon trees. The climate was cooler, wetter and probably stormier than at present, perhaps not dissimilar to that occurring on the present west coasts of Tasmania and New Zealand's South Island.

Nothing is yet known of the physical characteristics of these early people, for no skeletal remains have been found. However, it is very likely that they represent among the world's earliest examples of modern man (*Homo sapiens*) who is known to have lived at Lake Mungo (35,000 years BP) and whose artefacts have been found in the Sydney region dating from about 20,000 years ago. At this stage it appears that the site of first European settlement in Australia, and the oldest known site occupied by prehistoric people, lie nearly side by side.